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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|------------------------|---------------------|------------------|
| 10/035,107 | 12/27/2001 | Ronald C. Gonsiorawski | ASE-08 CIP | 2527 |
| 7590 | 11/26/2003 | | | |
| | | | EXAMINER | |
| | | | MUTSCHELER, BRIAN L | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1753 | |

DATE MAILED: 11/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------|-------------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/035,107 | GONSIORAWSKI, RONALD C. | |
| | Examiner Brian L. Mutschler | Art Unit 1753 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.138(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 03 October 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 42-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 42-46 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) The translation of the foreign language provisional application has been received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|---|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s), _____ . |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ . | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Comments

1. Applicant's cancellation of claims 23, 24, 27, 29, 30, and 36-41 in the response received October 3, 2003, is acknowledged.
2. The objections to claims 27, 36, 37, 40, and 41 have been overcome by Applicant's cancellation of the claims.
3. The rejection of claims 23 and 24 under 35 U.S.C. § 112, second paragraph, has been overcome by Applicant's cancellation of the claims.
4. The rejection of claims 23, 24, 27, 29, 30, and 36-41 under 35 U.S.C. § 103 have been overcome by Applicant's cancellation of the claims.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
6. Claims 42-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 42 recites the limitation "said acid flux residue" in line 19. There is insufficient antecedent basis for this limitation in the claim. It is suggested that the phrase be changed to --said acidic flux residue--. The same applies to dependent claims 43 and 44.

Claim 45 recites the limitation "said acid flux residue" in line 12. There is insufficient antecedent basis for this limitation in the claim. It is suggested that the phrase be changed to --said acidic flux residue--. The same applies to dependent claim 46.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), herein referred to as US '382, in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, which can be found at <http://www.performancepolymers.com/prdcatlgsearch.html>.

Regarding claim 42, US '382 discloses a photovoltaic module comprising a plurality of photovoltaic cells 46 disposed between a transparent front panel 42 and a back sheet 50 and encapsulated by a light-transmitting zinc ionomer 44 and 48 (col. 5, lines 27-64; fig. 7). The zinc ionomer 44,48 is an ethylene-methacrylic acid copolymer or ethylene-acrylic acid copolymer (col. 7, lines 59-67). The zinc ionomer is resistant to acid chemical attack and has a melting point of about 95°C (physical properties of the material sold under the trade name Surlyn™ 1702 and 1650). The physical properties

of Surlyn™ 1702 and 1650 are similar to the physical properties disclosed for Surlyn™ 1705-1 in Tables I and II of the instant specification. Furthermore, US '382 teaches, "various other ionomer products may also be used" (col. 8, lines 13-15). The photovoltaic cells **46** are connected by conductors **47** physically and electrically connected to front and back contacts using solder connections (col. 5, line 42). US '382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35). The encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18). The front support sheet **42** is made of clear transparent glass (col. 5, line 30).

The solar cell module disclosed in US '382 differs from the instant invention because US '382 does not disclose the following:

- a. Solder using an acidic flux, as recited in claim 42.
- b. The ionomer absorbs no more than 0.3 wt% water, as recited in claims 42.
- c. A melt flow index of 5.5, a melting point of 95°C, a Vicat softening point of 65°C, a freezing point of 61°C, an ultimate tensile strength of 5300 psi (MD) and 5100 psi (TD), and is substantially inert with respect to reaction with acid flux residue, as recited in claim 42.
- d. The photovoltaic module exhibits no loss in electrical photovoltaic performance after 1000 hours of exposure to 85% RH/85°C damp heat

and after 20 cycles of change of conditions between 85% RH/85°C and 0%RH/-40°C, as recited in claim 42.

Gonsiorawski et al. disclose the use of "Xersin 2005" fluxing agent, which is comprised of "Pentoate", or mildly activated rosin flux because "they have been found to demonstrate superior thermal aging properties" (col. 4, lines 19-42).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solder used in the module of US '382 to use a solder flux as taught by Gonsiorawski et al. because the solder flux has superior thermal aging properties.

US '382 does not disclose the water absorption properties of the Surlyn™ 1702 and 1650. Since Surlyn™ 1702 and 1650 are similar to Surlyn™ 1705-1 and has similar physical properties, Surlyn™ 1702 and 1650 would be expected to have a similar water absorption property.

Surlyn™ 1702 and 1650 have similar physical properties to Surlyn™ 1705-1, which has the physical properties listed in the instant claim. The properties of the Surlyn™ resins are dependent on the molecular weight of each resin and the metal or metal salt added. Surlyn™ 1650, 1702 and 1705-1 are zinc ionomers. The DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650 and 1702. From information obtained from the Performance Polymers Product Catalog, physical property data for Surlyn™ 1650, 1702 and 1705-1 is presented in Table I below.

Table I: Physical properties of Surlyn™ 1650, 1702 and 1705-1

| | Surlyn™ 1650 | Surlyn™ 1702 | Surlyn™ 1705-1 |
|--------------------------|---------------------------|---------------------------|---------------------------|
| Ion Type | Zinc | Zinc | Zinc |
| Melt Flow Index | 1.55 dg/min | 14.0 dg/min | 5.50 dg/min |
| Melt Point | 97.2°C | 92.8°C | 95.0°C |
| Vicat Softening Point | 72.8°C | 65.0°C | 65.0°C |
| Density | 0.950 g/cm³ | 0.950 g/cm³ | 0.950 g/cm³ |
| Tensile Strength (MD/TD) | 5,500 psi/ 5,500 psi | 3,600 psi/ 3,300 psi | 5,300 psi/ 5,100 psi |
| Secant Modulus (MD/TD) | 40,000 psi/ 40,000 psi | 34,000 psi/ 30,000 psi | 35,000 psi/ 34,000 psi |

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the ionomer in the module of US '382 to use a resin such as Surlyn™ 1705-1 because the ionomers have similar properties and would be expected to function equivalently. Since the physical properties of Surlyn™ 1705-1 have values which lie between the values of Surlyn™ 1650 and 1702, the compounds are chemical synonyms (DuPont MSDS), and US '382 teaches that "various other ionomer products may also be used", one skilled in the art would have had a reasonable expectation of success for the substitution of such similar materials as an encapsulant in a solar cell device. See MPEP § 2144.07.

9. Claims 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), herein referred to as US '382, in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920) and Mientus et al. (U.S. Pat. No. 6,106,982), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, which can be found at <http://www.performancepolymers.com/prdcatalogsearch.html>.

Hanoka and Gonsiorawski et al. describe a photovoltaic module having the limitations recited in claim 42 of the instant invention, as explained above in section 8.

Regarding claims 43 and 45, Hanoka discloses that the encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18).

Regarding claim 44, US '382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35).

Regarding claim 45, US '382 discloses a photovoltaic module comprising a plurality of photovoltaic cells **46** disposed between a transparent front panel **42** and a back sheet **50** and encapsulated by a light-transmitting zinc ionomer **44** and **48** (col. 5, lines 27-64; fig. 7). The zinc ionomer **44,48** is an ethylene-methacrylic acid copolymer or ethylene-acrylic acid copolymer (col. 7, lines 59-67). The zinc ionomer is resistant to acid chemical attack and has a melting point of about 95°C (physical properties of the

material sold under the trade name Surlyn™ 1702 and 1650). The physical properties of Surlyn™ 1702 and 1650 are similar to the physical properties disclosed for Surlyn™ 1705-1 in Tables I and II of the instant specification. Furthermore, US '382 teaches, "various other ionomer products may also be used" (col. 8, lines 13-15). The photovoltaic cells 46 are connected by conductors 47 physically and electrically connected to front and back contacts using solder connections (col. 5, line 42). US '382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35). The encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18). The front support sheet 42 is made of clear transparent glass (col. 5, line 30).

The solar cell module disclosed in US '382 differs from the instant invention because US '382 does not disclose the following:

- a. A UV light absorber comprising the compound sold under the tradename Tinuvin™ 328 and a UV light stabilizer sold under the tradename Chimassorb™ 944, as recited in claims 43 and 45.
- b. Solder using an acidic flux, as recited in claim 45.
- c. The ionomer absorbs no more than 0.3 wt% water, as recited in claims 45.
- d. A melt flow index of 5.5, a melting point of 95°C, a Vicat softening point of 65°C, a freezing point of 61°C, an ultimate tensile strength of 5300 psi

- (MD) and 5100 psi (TD), and is substantially inert with respect to reaction with acid flux residue, as recited in claim 45.
- e. The photovoltaic module exhibits no loss in electrical photovoltaic performance after 1000 hours of exposure to 85% RH/85°C damp heat and after 20 cycles of change of conditions between 85% RH/85°C and 0%RH/-40°C, as recited in claim 45.

Regarding claims 43 and 45, Mientus et al. disclose the modification of ionomers including Surlyn™ 1650, 1702 and 1705-1 with UV stabilizers such as Chimassorb™ 944 and UV light absorbers including Tinuvin™ 328 at a range of up to 2.5% by weight (col. 18, lines 8-61 and col. 19, lines 11-30). Mientus et al. also disclose the use of stabilizers including Cyasorb™ in addition to Tinuvin™ and Chimassorb™ (col. 11, lines 29-33).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the stabilizer and absorber used in the photovoltaic device described by US '382 to use the compounds sold under the tradenames Tinuvin™ 328 and Chimassorb™ 944, as taught by Mientus et al. because Mientus et al. discloses that such absorbers and stabilizers are equivalent to the line of absorbers and stabilizers used by US '382, and the use of equivalent materials for there intended purpose would have been obvious to one skilled in the art.

Regarding claim 45, Gonsiorawski et al. disclose the use of "Xersin 2005" fluxing agent, which is comprised of "Pentoate", or mildly activated rosin flux because "they have been found to demonstrate superior thermal aging properties" (col. 4, lines 19-42).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solder used in the module of US '382 to use a solder flux as taught by Gonsiorawski et al. because the solder flux has superior thermal aging properties.

Regarding claim 45, US '382 does not disclose the water absorption properties of the Surlyn™ 1702 and 1650. Since Surlyn™ 1702 and 1650 are similar to Surlyn™ 1705-1 and has similar physical properties, Surlyn™ 1702 and 1650 would be expected to have a similar water absorption property.

Surlyn™ 1702 and 1650 have similar physical properties to Surlyn™ 1705-1, which has the physical properties listed in the instant claim. The properties of the Surlyn™ resins are dependent on the molecular weight of each resin and the metal or metal salt added. Surlyn™ 1650, 1702 and 1705-1 are zinc ionomers. The DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650 and 1702. From information obtained from the Performance Polymers Product Catalog, physical property data for Surlyn™ 1650, 1702 and 1705-1 is presented in Table I above.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the ionomer in the module of US '382 to use a

resin such as Surlyn™ 1705-1 because the ionomers have similar properties and would be expected to function equivalently. Since the physical properties of Surlyn™ 1705-1 have values which lie between the values of Surlyn™ 1650 and 1702, the compounds are chemical synonyms (DuPont MSDS), and US '382 teaches that "various other ionomer products may also be used", one skilled in the art would have had a reasonable expectation of success for the substitution of such similar materials as an encapsulant in a solar cell device. See MPEP § 2144.07.

10. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), herein referred to as US '382, in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920) and Mientus et al. (U.S. Pat. No. 6,106,982), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, found at <http://www.performancepolymers.com/prdcatalogsearch.html>, as applied above to claims 43-45, and further in view of Hanoka et al. (U.S. Pat. No. 6,353,042), herein referred to as US '042.

US '382, Gonsiorawski et al., and Mientus et al. describe a photovoltaic module having the limitations recited in claims 43-45, as explained above in section 9.

The module described by US '382, Gonsiorawski et al., and Mientus et al. differs from the instant invention because they do not disclose the use of cadmium telluride and CIGS cells, as recited in claim 46.

US '042 discloses an encapsulated photovoltaic module using thin film cells comprised of materials such as amorphous silicon, CIGS or cadmium telluride (col. 6, lines 19-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified semiconductor layer in the photovoltaic module described by US '382, Gonsiorawski et al., Mientus et al. to use thin film cells or cells made from CIGS or cadmium telluride, as taught by US '042, because thin film CIGS and cadmium telluride photovoltaic cells are capable of producing energy using sunlight in a manner equivalent to amorphous silicon.

Response to Arguments

11. Applicant's arguments filed October 3, 2003, have been fully considered but they are not persuasive.
12. Applicant has made the following arguments:
 - a. The prior art does not teach the performance stability recited in the instant claims (see page 4 of Applicant's response).
 - b. US '382 does not disclose or suggest a module having photovoltaic cells interconnected by soldered solar cell connections having an acidic flux residue and encapsulated by a zinc ionomer encapsulant that absorbs no more than 0.3 wt. % water (see page 5 of Applicant's response).
 - c. Differences in ionomer properties are significant (see page 6 of Applicant's response).

- d. Applicant's use of Surlyn™ 1705-1 solves a problem of degradation (see page 6 of Applicant's response).
 - e. Ionomers are not equivalent (see pages 6-8 of Applicant's response).
 - f. The Mientus et al. reference is non-analogous art because it is in the electrographic industry (see page 7 of Applicant's response).
13. Regarding the arguments presented in (a), (b), (c), (d), and (e), as explained in the prior Office action, the performance stability does not structurally define the PV cell. Performance stability is a result of a structure. US '382 teaches the use of Surlyn™ 1702 and Surlyn™ 1650, which are both zinc ionomers, and also teaches that other ionomers may be used (see US '382 col. 8, lines 10-16). As seen in Table I above, compiled from information obtained in the Performance Polymer catalog, Surlyn™ 1705-1 has properties with values falling within the range set by the two expressly disclosed ionomers. Therefore, one skilled in the art would have been motivated to select other ionomers, such as Surlyn™ 1705-1, because US '382 teaches that other ionomers may be used and Surlyn™ 1705-1 has physical properties within the ranges established by Surlyn™ 1650 and Surlyn™ 1702 as ionomers appropriate for encapsulating PV cells. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Since the structure of the PV cell, including the materials, is taught or suggested by the prior art, the cell resulting from the combination would be expected to perform in the same manner because it is structurally identical to the PV cell recited in the instant claims. A showing

of unexpected results must be based on evidence, not argument or speculation. *In re Mayne*, 104 F.3d 1339, 1343-44, 41 USPQ2d 1451, 1455-56 (Fed. Cir. 1997).

Therefore, since Applicant has not provided evidence of unexpected results and the combination is suggested by the prior art, the arguments are not persuasive.

14. Further regarding the argument presented in (b), US '382 teaches that the usual practice of connecting solar cells is by using a solder paste, as taught by Gonsiorawski et al. in U.S. Pat. No. 5,074,920. As disclosed in US '920 and in the instant disclosure on page 7, the solder comprises an acidic flux. Furthermore, the solder is capable of resisting thermal degradation. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used the solder because it resists thermal degradation.

15. Regarding argument (f), Applicant argues that the use of the UV stabilizers and UV light absorbers would not have been obvious to one skilled in the art because they are taught in a reference in a non-analogous art. This argument is not persuasive because both the instant invention and the prior art of record are concerned with the negative effects of UV radiation on ionomer encapsulants, which are overcome by the use of additives such as UV stabilizers and UV additives. Therefore, the instant invention and the prior art relate to similar fields of endeavor, the prevention of UV degradation of ionomers.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703) 305-0180. The examiner can normally be reached on Monday-Friday from 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

blm
November 18, 2003